

SDSS J1240–01: A NEW AM CVN CANDIDATE FROM THE SLOAN DIGITAL SKY SURVEY

G. H. A. Roelofs,¹ P. J. Groot,¹ D. Steeghs,² and G. Nelemans³

A better understanding of the AM CVn population is crucial to constrain their candidacy as SN Ia progenitors, to test binary evolution (in particular the common-envelope phase), and to predict their observable gravitational radiation signature. An AM CVn-dedicated search in the Sloan Digital Sky Survey-DR1 resulted in the discovery of SDSS J124058.03–015919.2, a new AM CVn candidate previously identified as a DB white dwarf in the 2dF quasar survey.

Both the SDSS and 2dF spectra show double-peaked helium emission lines and absence of any such hydrogen lines, indicating a helium-dominated accretion disk. They further show broad absorption features in the blue, which resulted in its DB white dwarf classification. The continuum can be fitted well with a 17,000 K blackbody. The system appears to be quite old and reminds of GP Com and CE 315 (low mass transfer; optically thin disk) but its still quite hot white dwarf primary, possibly re-heated by recent high mass transfer, indicates a much younger system.

Our first optical follow-up (taken 13-12-2003 with Magellan-I, spectral resolution 3 Å) clearly shows the double-peaked He I emission lines as well as He II $\lambda 4686$ and N III $\lambda 4634+4640$. This combination suggests either a Bowen fluorescence mechanism at work (cf. Casares et al. 2003) or an extreme nitrogen abundance in the system (cf. Gänsicke et al. 2003). He II $\lambda 4686$ is observed in most AM CVns, although in SDSS J1240 it is unusually strong compared to He I $\lambda 4713$ (equivalent widths -4.0 Å and -4.4 Å respectively, $\pm 10\%$). No traces of N III $\lambda 4634+4640$ are found in high-quality spectra of GP Com and CE 315, while in the new system it is remarkably strong at an equivalent width of -2.4 Å, more than half that of the He I $\lambda 4713$ line. The FWHM of these lines is only a quarter that of the helium lines (~ 5 Å versus ~ 20 Å), which suggests a non-disk origin. The strongest helium line at 5875 Å has an equivalent width of -31 Å compared to -78 Å in GP Com,

which can be explained nicely with an equally luminous, optically thin disk contributing little to the continuum, plus a primary that is more luminous by the factor expected from its higher temperature (17,000 K versus 11,000 K for GP Com, Marsh et al. 1991).

The AM CVn nature of the new system has yet to be proved beyond doubt with spectroscopic follow-up giving its orbital period, which we expect to be between 30–40 minutes. This places it between the cooler, shortest-period emission-line system GP Com and the longest-period systems among the outbursting AM CVns.

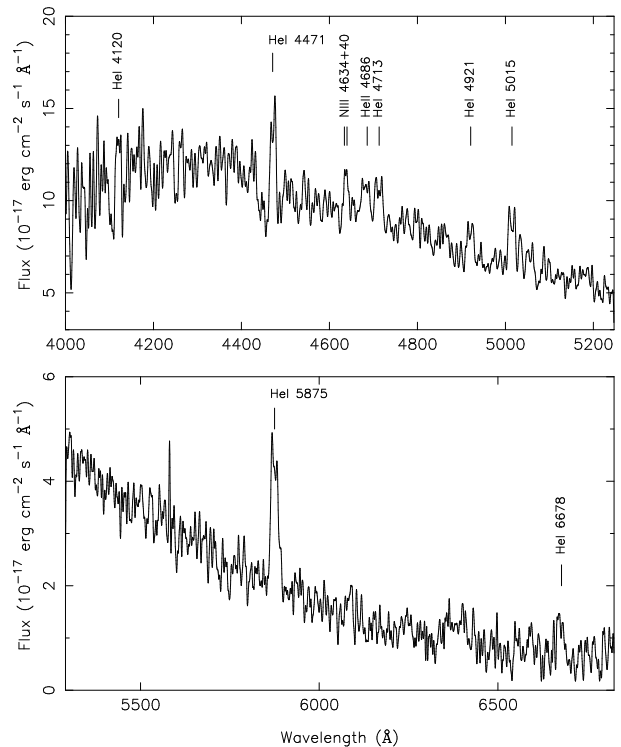


Fig. 1. The new AM CVn candidate SDSS J1240–01, observed 13-12-2003 with IMACS at Magellan-I.

REFERENCES

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¹Dep. of Astrophysics, Univ. of Nijmegen, P.O. Box 9010, 6500 GL Nijmegen, The Netherlands (gijsroel@astro.kun.nl).

²Harvard-Smithsonian CfA, Cambridge, USA

³Institute of Astronomy, Cambridge, UK